In the Drawings:

As requested by the examiner, applicants have amended figures 15, 16(a)-(f), 17(a)-(b), and 18(a)-(b) to add the legend "Prior Art". Furthermore, as requested by the examiner and in compliance with 37 C.F.R 1.83(a), figures 19 and 20 are newly added without adding any new material. Support for newly added figure 19 can be found on page 37, line 17- page 38, line 3 of the application-as-filed (or paragraph 113 of the published application). Support for newly added figure 20 can be found on page 38, line 18- page 39, line 5 of the application-as-filed (or paragraph 116 of the published application).

REMARKS

This amendment is in response to the Examiner's Office Action dated 10/18/2004. Applicants are appreciative of the indication of allowable subject matter. Reconsideration of this application is respectfully requested in view of the foregoing amendment and the remarks that follow.

STATUS OF CLAIMS

Claims 1-15, 18-20, 22-25 and 27-32 are pending.

Claim 6 is allowed.

Claims 13-15, 18-20, 22-25, 27 and 28 are objected to due to informalities.

Claims 10, 19, 20, 22 and 27-32 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-4, 7-9, 12-15, 18, 22-25 and 28-30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Gentzler (USP 6046635) in view of Watanabe (JP 62-141824 cited by applicant).

OVERVIEW OF CLAIMED INVENTION

The presently claimed invention provides for a signal cancellation method comprising the steps of splitting an input signal into a first and a second signal, splitting the second signal into mutually orthogonal first and second subsignals, recombining the first and second subsignals to form a third signal after respective amplitudes thereof have been adjusted, and canceling said first signal by the third signal thereby obtained.

The present invention also provides for a signal cancellation method comprising the steps of splitting an input signal into a first and a second signal, splitting the second signal into mutually in-phase first, second, and third subsignals, recombining the first and second subsignals to form a third signal after respective amplitudes thereof have been adjusted, and canceling the first signal by the third signal thereby obtained. In this implementation, the third subsignal is delayed, the first and second subsignals are combined in mutually orthogonal phase after amplitude adjustment and the third subsignal (after said delay) is combined in a freely selected phase in the quadrant opposite the first and second subsignals.

The present invention also provides for a feed-forward amplifier comprising a signal cancellation device in one of a pre-stage distortion extraction loop and a post-stage distortion loop. The signal cancellation device of the present invention comprises an orthogonal splitter, a first and second amplitude adjusters, and an in-phase combiner. The orthogonal splitter splits each input signal into a first and second subsignals which are mutually orthogonal. The first and second amplitude adjusters are able to adjust the amplitudes of the first and second subsignals and the in-phase combiner combines, in-phase, said first and second subsignals which have undergone amplitude adjustment.

In another implementation, the signal cancellation device comprises an in-phase splitter, a first and second amplitude adjusters, and an orthogonal combiner. The in-phase splitter splits each input signals into a first and second subsignals having the same phase. The first and second amplitude adjusters are able to adjust the amplitudes of the first and second subsignals and the orthogonal combiner orthogonally combines the first and second subsignals which have undergone amplitude adjustment.

In the Claims

The examiner has objected to claims 13-15, 18-20, 22-25, 27 and 28 due to informalities identified on pages3-4 of the office action of 10/18/2004. Minor amendments have been made with respect to claims 13, 14, and 18 to overcome inconsistencies pointed out by the examiner. It is, therefore, respectfully requested that the objection be removed.

REJECTIONS UNDER 35 U.S.C. § 112, SECOND PARAGRAPH

Claims 10, 19, 20, 22 and 27-32 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to claim 10, the examiner states that the phrase "said second subsignals" lacks antecedent basis. Applicants respectfully disagree with the examiner and wish to point out that dependent claim 10 inherits all limitations from independent claim 2, which specifically recites a first instance of "second subsignals".

With respect to claim 19, the examiner states that the phrase "orthogonal combiner" lacks antecedent basis. Minor amendments have been made in claim 19 to correct the inconsistencies without adding new matter. With respect to claims 20 and 27, the examiner is directed to page 38, line 18- page 39, line 5 of the application-as-filed (or paragraph 116 of the published application) and newly added figure 20, wherein a description is provided regarding splitting input signals (signals input to the amplitude adjuster). Minor amendments have been made in

claims 20 and 27 to correct the inconsistencies without adding new matter. Claims 22, 28, 29, 30, 31, and 32 have also been amended to correct minor inconsistencies.

It is, therefore, respectfully requested that the rejections be removed with respect to claims 10, 19, 20, 22 and 27-32.

REJECTIONS UNDER 35 U.S.C. § 103(a)

The examiner has rejected independent claims 1, 2, 6, 13, 14, 29 and 30 under 35 U.S.C. § 103(a) as being unpatentable over Gentzler (USP 6046635) in view of Watanabe (JP 62-141824 cited by applicant). To be properly rejected under 35 U.S.C. § 103(a), there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Applicants contend that the combination of Gentzler and Watanabe fail to anticipate or render obvious many of the limitations of rejected claims 1, 2, 6, 13, 14, 29 and 30.

Gentzler et al. provides for a feed-forward type arrangement for amplifying an input signal with which a distortion canceling input is combined. The setup of Gentzler et al. features a main amplifier (typically a class AB amplifier), an error loop including a comparator which differences a delayed derivative of the input signal to the amplifier arrangement with a signal representative of the output of the main amplifier to produce an error signal, a first distortion controlled feedback loop including a detector for receiving the error signal and generating a detected error signal output, and a distortion signal generation circuit for generating a predistortion signal.

Watanabe, on the other hand, teaches a pre-distortion type arrangement to generate a reverse distortion approximating a desired distortion characteristic by aligning plural distortion output circuits in parallel.

The present invention, on the other hand, provides for a signal cancellation method comprising the steps of splitting an input signal into a first and a second signal, splitting the second signal into mutually in-phase first, second, and third subsignals, recombining the first and second subsignals to form a third signal after respective amplitudes thereof have been adjusted, and canceling the first signal by the third signal thereby obtained. In one implementation, the third subsignal is delayed, the first and second subsignals are combined in mutually orthogonal phase after amplitude adjustment and the third subsignal (after said delay) is combined in a freely selected phase in the quadrant opposite the first and second subsignals.

As outlined above, the Gentzler reference provides for a feed forward (FF) type implementation and the Watanabe reference provides for a pre-distortion (PD) type implementation. Applicants contend that a FF implementation and a PD implementation cannot be combined. The examiner is reminded that the showing of combinability must be clear and particular. There is no motivation or suggestion in the Watanabe reference for using output signals for signal cancellation. The only suggestion comes from applicants own disclosure. Applicants with to emphasize that the signals corresponding to "first distortion output circuit" 20 and "second distortion output circuit" 21 of Watanabe reference are distorted signals and such signals cannot be used for signal canceling, a requirement of rejected independent claims 1, 2, 6, 13, 14, 29 and 30. Hence, applicants contend that the teachings of Gentzler and Watanabe

references cannot be combined as the teaching of a FF implementation cannot be incorporated into a PD implementation.

Furthermore, independent claims 1, 13, and 29 each recite an orthogonal splitter which splits each signal into first and second subsignals which are mutually orthogonal. The examiner cites column 3, lines 15-30 of the Gentzler reference as providing such a limitation. A closer reading of the citations, however, fails to explicitly or implicitly mention signals being split in an orthogonal manner. Conspicuously absent in the citations is any mention of splitting a signal into a first and second mutually orthogonal subsignals.

Also, applicants' claim 1, 13, and 29 teaches the cancellation of the first signal (based on splitting the input signal) by the third signal (obtained by recombining the first and second subsignals after adjusting amplitudes). With regards to this limitation, the examiner states that the "first signal on line 78 is cancelled by the formed signal 74". A closer reading of figure 1 of the Gentzler reference merely teaches canceling distortion component added by the main amplifier 14. Specifically, the examiner is directed to column 4, lines 26-43 of the Gentzler reference for support of applicants' argument. There is no explicit or implicit teaching in Gentzler for the cancellation of a first signal formed based on splitting the input signal by a third signal obtained by recombining the first and second subsignals after adjusting amplitudes.

With respect to claims 2, 14, 29, and 30, applicants agree with the examiner that the Gentzler reference fails to show or suggest the adjustment of amplitudes in the split subsignals. However, applicants respectfully disagree with the examiner that such a limitation is provided for by the Watanabe reference. However, as pointed out earlier applicants wish to emphasize

that the teachings of Gentzler and the Watanabe references cannot be combined as the teaching of a FF implementation cannot be incorporated into a PD implementation.

The above-mentioned arguments substantially apply to dependent claims 3-5, 7-12, 15-25, and 27-28 as they inherit all the limitations of the claim from which they depend. Hence, in view of the remarks set forth above, applicants believe that the application is in condition for allowance.

SUMMARY

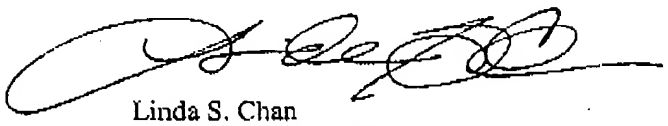
As has been detailed above, none of the references, cited or applied, provide for the specific claimed details of applicant's presently claimed invention, nor renders them obvious. It is believed that this case is in condition for allowance and reconsideration thereof and early issuance is respectfully requested.

This amendment is being filed with a petition for extension of time. The Commissioner is hereby authorized to charge the petition fee, as well as any deficiencies in the fees provided to Deposit Account No. 50-1290.

FUJ 17.619
09/725,552

If it is felt that an interview would expedite prosecution of this application, please do not hesitate to contact applicant's representative at the below number.

Respectfully submitted,



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February 18, 2005